Summary of PGR use on wheat and barley

Key Points

- CCC is usually adequate on wheat where lodging risk is low.
- CCC/Moddus mix on wheat and barley has resulted in less lodging than either product applied alone.
- CCC shouldn’t be used on barley by itself, due to an occurrence called ‘bounce back’.
- Terpal can help prevent yield loss in wheat at high risk to lodging.
- PGR use on spring barley is harder to justify, unless there is a risk of stem & neck break.
- Only apply Terpal to barley that is free of any stresses before and after treatment.
- PGRs may work better when applied during cloudy muggy weather.

This update provides a current summary of the most successful plant growth regulator (PGR) rate and timing information from FAR, Arable Research Centres (ARC) and Morley Research Centre (MRC) in the UK. Please note this document is not intended to provide recommendations, but a generalised overview of PGR use to assist decision-making.

Crops that suffer from lodging, stem break or neck break will benefit from a PGR. The focus is on prevention of a likely problem and providing protection to that part of the crop at risk. Lodging control requires earlier applications than those targeted to prevent stem and neck break, e.g. neck break in barley should be treated at GS41-49 while basal lodging in wheat benefits from GS30/31.

It should be noted that PGR response can differ between cultivars. Contact the relevant seed company for experienced advice.

Read the label carefully when considering tank mixing (especially herbicides). If in any doubt, contact the relevant chemical companies.

Wheat

Chlormequat has been the standard in recent times in NZ, though timings and mixtures with other products have been studied lately. FAR trials have used the product Cycocel 750 (CCC), but other chlormequat products are available.

CCC alone is usually adequate where lodging risk is low. While 3-8% yield increases are typical over a number of seasons, consistent yield increases (0.7t/ha) and shorter crops were observed in 1999 with GS31 applications of CCC 1.5L + Moddus 0.2L/ha across a range of sites and cultivars. MRC has found this mixture gives shorter straw lengths with less lodging when compared to either CCC or Moddus used alone. Moddus rates of 0.4L/ha have shown either no, or only very slight, benefits.

NZ work in 1998 on Moddus showed no yield benefits from Moddus alone although the straw was shorter and heavier (if the straw market remained buoyant Moddus could be a useful tool!?).

Where PGR applications are later than recommended (GS31/32, or GS32), then addition of Moddus (0.2L/ha) to CCC should be beneficial.

NZ work is consistent with the UK whereby Terpal at GS39 has given significantly shorter straw, but only significant yield increases on taller, weaker cultivars. This yield response is due more to yield loss prevention than yield promotion (please note that Terpal is not registered in wheat).

NZ work has shown no economic benefit to split rates at GS25 & 31. ARC has found benefits on the weaker strawed cultivars when split 2/3 rate CCC at GS30, then 1/3 rate at GS31. MRC agree that if split, apply the 2/3 rate first. Slight yield advantages were seen in NZ from a GS30/31 then GS31/32 split.

In Europe suggestions have been made that PGR during tillering can enhance root development and anchorage. Alternatively MRC is investigating whether PGR during tillering may increase grain sites, which, unless adequate resources are available, may be harder to fill. In recent NZ work all PGRs have shown a trend to lower thousand grain weights and higher screenings. This trend was slight and was reported to be a function of tillers 2, 3 and 4 getting more of the plants resources at the expense of the mainstem.

MRC suggests that CCC works better if applied during cloudy humid weather, as uptake of the product is optimal, and the product is applied at a time when rapid growth is beginning.

Examples of successful PGR treatments on wheat

Slight risk of lodging:
0.75 – 1.5L/ha CCC at GS30(31).
**Moderate risk:**
1.25L CCC + 0.2L/ha Moddus at GS30/31 (apply this mixture at GS32 if GS30(31) CCC timing missed), or a CCC split: 1.25L at GS30/31 then 0.75L/ha at GS31.

**Higher risk:**
1.25L CCC + 0.2L/ha Moddus at GS31, followed by 1.0L/ha Terpal at GS39/41.

**Barley**
FAR results on barley have been inconsistent between cultivars and sites, although all PGR treatments have decreased straw height. Trials in 1999 produced the shortest barley when Moddus and Terpal were used in sequence, rather than either alone. A non-significant positive yield trend was also apparent for the sequence.

Because of inconsistencies in NZ work it has been even more useful to observe successful treatments from abroad. Again successful treatments were often due to yield loss prevention rather than yield promotion.

Indeed for spring barley, ARC have historically failed to show a benefit from PGR application, while MRC does not use PGR on spring barley unless N rates are 150kg/ha or more. Conversely, it should be added that ARC have observed increased lodging and neck break problems for the latest sown spring barley because of the long weak straw that is produced in such crops (a good case to use Terpal later at GS45/49).

However both research centres have tested strategies for winter barley which should give clues to pre-September sown crops in NZ. It is documented in the UK that CCC used alone in winter barley results in a taller crop with more lodging than if no PGR was applied at all. This anomaly is due to a later compensatory extension of the upper internodes termed as 'bounce back'.

MRC suggest that "on barley, PGRs have more effect on tiller survival and less effect on final straw length than it does on wheat so it provides less consistent lodging control".

**Examples of successful PGR treatments on barley**

**Moderate risk of stem & neck break:**
1.0L/ha Terpal (plus non-ionic wetter) at GS39-49.

**Moderate risk of lodging and stem & neck break:**
1.25L CCC + 0.1L/ha Moddus at GS30/31 or 1.25L CCC at GS30/31 + (0.5-)1.0L/ha Terpal (plus non-ionic wetter) at GS39-49.

**Higher risk:**
1.25L CCC + 0.2L/ha Moddus at GS31, followed by 1.0L/ha Terpal (plus non-ionic wetter) at GS39-49.

**GS30** = Ear at 1cm (until 1st internode reaches 1cm).

**GS31** = 1st node detectable (until 2nd internode reaches 2cm).

The English use Terpal when 'favourable stem extension growth' is likely, at 1.0L/ha at GS39 with a non-ionic wetter. ARC and MRC warn against higher rates of Terpal if the crops are stressed (e.g. moisture, take-all), due to the increased risks of reduced grain size. MRC suggests a CCC/Moddus mixture could be attractive on light land where there are fears that the crop will be under drought stress by the time Terpal would be applied. The 'label' for Terpal in NZ says, "Secondary tillering may be induced by early treatment and this effect will be more noticeable on crops which come under stress following treatment, or in crops growing in light soils". Do not mix Terpal with herbicides.

ARC & MRC both include CCC at GS30/31 as part of their standard program, but in mixture or in sequence with Moddus or Terpal respectively. Moddus +/- CCC extends the basal lodging control and a sequence with Terpal has been effective at shortening upper internodes and controlling stem & neck break (Fig 1).

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